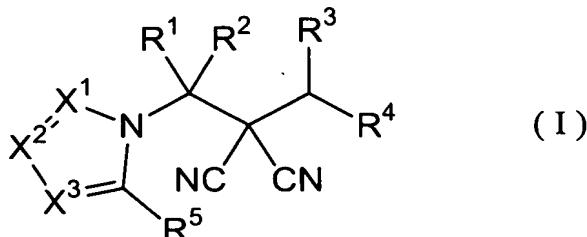


CLAIMS

1. A malononitrile compound represented by the formula (I):



5 , wherein, in the formula,

R¹ represents a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C2-C5 alkenyl group optionally substituted by at least one halogen atom, a C2-C5 alkynyl group optionally substituted by at least one halogen atom or a hydrogen

10 atom;

R² represents a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, a C2-C5 alkenyl group optionally substituted by at least one halogen atom, a C2-C5

15 alkynyl group optionally substituted by at least one halogen atom, a cyano group or a hydrogen atom;

each of R³ and R⁴ represents a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C2-C5 alkenyl group optionally substituted by at least one halogen atom, a C2-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C5 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a C4-C5 cycloalkenyl group optionally substituted by at least one halogen atom or a hydrogen atom,

20 or represents a C2-C6 alkanediyl group optionally substituted

by at least one halogen atom or C4-C6 alkenediyl group optionally substituted by at least one halogen atom in which R³ and R⁴ are coupled one another at the end thereof;

each of X¹, X² and X³ represents a nitrogen atom or a CR⁶;

5 each of R⁵ and R⁶ represents a halogen atom, a cyano group, a nitro group, a hydroxyl group, a mercapto group, a formyl group, a SF₅ group, a carboxyl group, a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C2-C5 alkenyl group optionally substituted by at least one halogen atom, a C2-C5
10 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, a C3-C6 alkenyloxy group optionally substituted by at least one
15 halogen atom, a C3-C6 alkynyloxy group optionally substituted by at least one halogen atom, a C1-C5 alkylthio group optionally substituted by at least one halogen atom, a C3-C5 alkenylthio group optionally substituted by at least one halogen atom, a C3-C5 alkynylthio group optionally substituted by at least one
20 halogen atom, a C1-C5 alkylsulfinyl group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfonyl group optionally substituted by at least one halogen atom, a C2-C6 alkylcarbonyl group optionally substituted by at least one halogen atom, a C2-C5 alkoxy carbonyl group optionally substituted by at least one
25 halogen atom, a group designated by NR¹⁰R¹¹, a group designated by C(=X⁵)NR¹²NR¹³, a group designated by (CH₂)_mQ, a group designated by C(=NOR¹⁷)R¹⁸ or a hydrogen atom;
in case of two atoms are adjoined and each of the adjoined two

atoms is bonded with one of R⁵ and R⁶ or two R⁶'s; the R⁵ and R⁶, which are bonded with the adjoined two atoms or the two R⁶'s, which are bonded with the adjoined two atoms, may be coupled one another at the end thereof and represent a C2-C6 alkanediyl group

5 optionally substituted by at least one halogen atom or C4-C6 alkenediyl group. And in this case, at least one methylene group structuring said alkanediyl group or said alkenediyl group may be replaced by an oxygen atom a sulfur atom or NR⁷ group; R⁷ represents a C1-C5 alkyl group optionally substituted by at

10 least one halogen atom, a C3-C5 alkenyl group optionally substituted by at least one halogen atom, a C3-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a C2-C6 alkylcarbonyl

15 group optionally substituted by at least one halogen atom, a C2-C5 alkoxy carbonyl group optionally substituted by at least one halogen atom or a hydrogen atom;

 each of R¹⁰ and R¹¹ represents a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C3-C5 alkenyl group

20 optionally substituted by at least one halogen atom, a C3-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a (C1-C5 alkoxy group optionally substituted by at least one halogen atom)

25 C1-C3 alkyl group, a C1-C5 alkylslufinyl group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfonyl group optionally substituted by at least one halogen atom, a C2-C6 alkylcarbonyl group optionally substituted by at least

one halogen atom, a C2-C5 alkoxy carbonyl group optionally substituted by at least one halogen atom or a hydrogen atom; each of R¹² and R¹³ represents a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C3-C5 alkenyl group 5 optionally substituted by at least one halogen atom, a C3-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a group designated by (CH₂)_mQ or a hydrogen atom;

10 or represents a C2-C6 alkanediyl group optionally substituted by at least one halogen atom or C4-C6 alkenediyl group optionally substituted by at least one halogen atom in which R¹² and R¹³ are coupled one another at the end thereof;

each of R¹⁷ and R¹⁸ represents a C1-C5 alkyl group optionally 15 substituted by at least one halogen atom, a C3-C5 alkenyl group optionally substituted by at least one halogen atom, a C3-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a group designated by (CH₂)_mQ or a hydrogen atom;

20 Q represents an aryl group optionally substituted by at least one R¹⁴;

each of R¹⁴'s represents

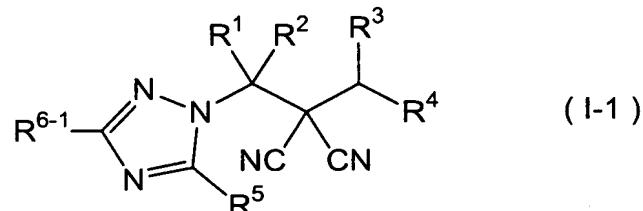
25 a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, C1-C5 alkylthio group optionally substituted by at least one halogen

atom, a C3-C5 alkenylthio group optionally substituted by at least one halogen atom, a C3-C5 alkynylthio group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfinyl group optionally substituted by at least one halogen atom, a 5 C1-C5 alkylsulfonyl group optionally substituted by at least halogen atom, C2-C6 alkylcarbonyl group optionally substituted by at least one halogen atom, C2-C5 alkoxy carbonyl group optionally substituted by at least one halogen atom or a halogen atom;

10 m represents an integer of from 0 to 5;

X⁵ represents an oxygen atom or a sulfur atom.

2. The malononitrile compound according to claim 1, which is represented by the formula (I-1):



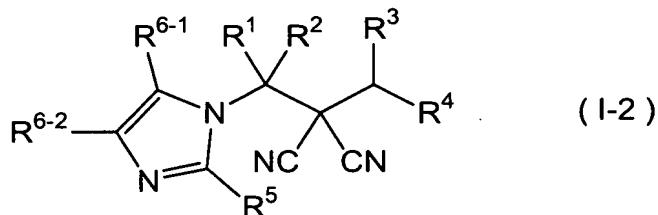
15

, wherein, in the formula,

R¹, R², R³ and R⁴ have the same meaning as defined in claim 1; each of R⁵ and R⁶⁻¹ represents a halogen atom, a cyano group, a nitro group, a hydroxyl group, a mercapto group, a formyl group, 20 a SF₅ group, a carboxyl group, a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C2-C5 alkenyl group optionally substituted by at least one halogen atom, a C2-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least 25 one halogen atom or at least one C1-C3 alkyl group, a C1-C5 alkoxy

group optionally substituted by at least one halogen atom, a C3-C6 alkenyloxy group optionally substituted by at least one halogen atom, a C3-C6 alkynyloxy group optionally substituted by at least one halogen atom, a C1-C5 alkylthio group optionally substituted by at least one halogen atom, a C3-C5 alkenylthio group 5 optionally substituted by at least one halogen atom, a C3-C5 alkynylthio group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfinyl group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfonyl group 10 optionally substituted by at least one halogen atom, a C2-C6 alkylcarbonyl group optionally substituted by at least one halogen atom, a C2-C5 alkoxy carbonyl group optionally substituted by at least one halogen atom, a phenyl group or a hydrogen atom.

15 3. The malononitrile compound according to claim 1, which is represented by the formula (I-2):

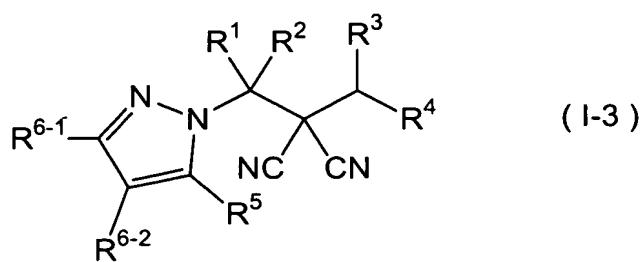


, wherein, in the formula,

20 R¹, R², R³ and R⁴ have the same meaning as defined in claim 1; each of R⁵, R⁶⁻¹ and R⁶⁻² represents a halogen atom, a cyano group, a nitro group, a hydroxyl group, a mercapto group, a formyl group, a SF₅ group, a carboxyl group, a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C2-C5 alkenyl group optionally substituted by at least one halogen atom, a C2-C5 alkynyl group 25 optionally substituted by at least one halogen

atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, a C3-C6 alkenyloxy group optionally substituted by at least one halogen atom, a C3-C6 alkynyloxy group optionally substituted by at least one halogen atom, a C1-C5 alkylthio group optionally substituted by at least one halogen atom, a C3-C5 alkenylthio group optionally substituted by at least one halogen atom, a C3-C5 alkynylthio group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfinyl group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfonyl group optionally substituted by at least one halogen atom, a C2-C6 alkylcarbonyl group optionally substituted by at least one halogen atom, a C2-C5 alkoxy carbonyl group optionally substituted by at least one halogen atom, a phenyl group or a hydrogen atom.

4. The malononitrile compound according to claim 1, which is represented by the formula (I-3):

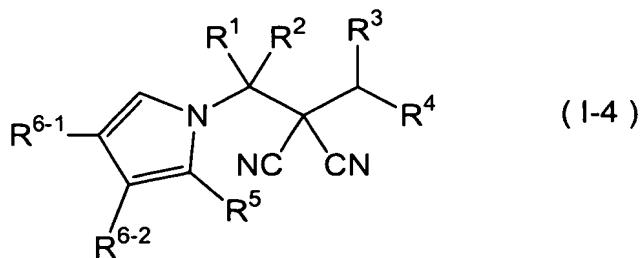


20 , wherein, in the formula,

R^1 , R^2 , R^3 and R^4 have the same meaning as defined in claim 1; each of R^5 , R^{6-1} and R^{6-2} represents a halogen atom, a cyano group, a nitro group, a hydroxyl group, a mercapto group, a formyl group, a SF_5 group, a carboxyl group, a C1-C5 alkyl group optionally

substituted by at least one halogen atom, a C2-C5alkenyl group optionally substituted by at least one halogen atom, a C2-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, a C3-C6 alkenyloxy group optionally substituted by at least one halogen atom, a C3-C6 alkynyloxy group optionally substituted by at least one halogen atom, a C1-C5 alkylthio group optionally substituted by at least one halogen atom, a C3-C5 alkenylthio group optionally substituted by at least one halogen atom, a C3-C5 alkynylthio group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfinyl group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfonyl group optionally substituted by at least one halogen atom, a C2-C6 alkylcarbonyl group optionally substituted by at least one halogen atom, a C2-C5 alkoxy carbonyl group optionally substituted by at least one halogen atom, a phenyl group or a hydrogen atom.

20 5. The malononitrile compound according to claim 1, which is represented by the formula (I-4):



, wherein, in the formula,

R¹, R², R³ and R⁴ have the same meaning as defined in claim 1;

each of R^5 , R^{6-1} and R^{6-2} represents a halogen atom, a cyano group, a nitro group, a hydroxyl group, a mercapto group, a formyl group, a SF_5 group, a carboxyl group, a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C2-C5 alkenyl group

5 optionally substituted by at least one halogen atom, a C2-C5 alkynyl group optionally substituted by at least one halogen atom, a C3-C6 cycloalkyl group optionally substituted by at least one halogen atom or at least one C1-C3 alkyl group, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, a

10 C3-C6 alkenyloxy group optionally substituted by at least one halogen atom, a C3-C6 alkynyloxy group optionally substituted by at least one halogen atom, a C1-C5 alkylthio group optionally substituted by at least one halogen atom, a C3-C5 alkenylthio group optionally substituted by at least one halogen atom, a

15 C3-C5 alkynylthio group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfinyl group optionally substituted by at least one halogen atom, a C1-C5 alkylsulfonyl group optionally substituted by at least one halogen atom, a C2-C6 alkylcarbonyl group optionally substituted by at least one

20 halogen atom, a C2-C5 alkoxy carbonyl group optionally substituted by at least one halogen atom, a phenyl group or a hydrogen atom.

6. The malononitrile compound according to any one of claim 2 to claim 5, wherein

25 R^5 is a hydrogen atom; each of R^5 , R^{6-1} and R^{6-2} is a halogen atom, a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C1-C5 alkoxy group optionally substituted by at least one halogen atom,

a C1-C5 alkylthio group optionally substituted by at least one halogen atom or a hydrogen atom.

7. The malononitrile compound according to any one of claim

5 2 to claim 5, wherein

R¹, R², R³ and R⁵ are hydrogen atoms;

R⁴ is a C1-C5 alkyl group optionally substituted by at least one halogen atom or a C2-C5 alkenyl group optionally substituted by at least one halogen atom;

10 each of R⁶⁻¹ and R⁶⁻² is a halogen atom, a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, a C1-C5 alkylthio group optionally substituted by at least one halogen atom or a hydrogen atom.

15

8. The malononitrile compound according to any one of claim
2 to claim 5, wherein

R¹, R², R³ and R⁵ are hydrogen atoms;

R⁴ is a 2,2,2-trifluoroethyl group or a vinyl group;

20 each of R⁶⁻¹ and R⁶⁻² is a halogen atom, a C1-C5 alkyl group optionally substituted by at least one halogen atom, a C1-C5 alkoxy group optionally substituted by at least one halogen atom, a C1-C5 alkylthio group optionally substituted by at least one halogen atom or a hydrogen atom.

25

9. A pesticide composition comprising an effective amount of the malononitrile compound according to claim 1 and a carrier.

10. A method for controlling pests comprising applying an effective amount of the malononitrile compound according to claim 1 to pests or at a habitat of pests.

5 11. Use of the malononitrile compound according to claim 1 for pest control agent.